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Filed : **November 27, 2001**

REMARKS

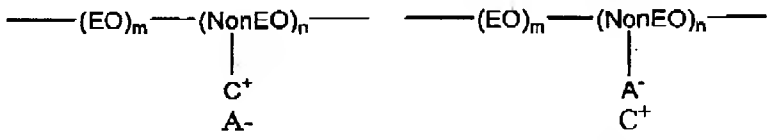
The claims have been amended so as to adopt better known terminology for the types of ions used in the conductors. Since the change is a matter of word choice, no added search is necessary.

Discussion of Rejection Under 35 U.S.C. § 112, ¶ 1

Claims 1-25 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

The terms "movable" and "non-movable" refer to the two types of ions within the electron- and hole-injecting layers of the single-ion conductors. The "movable" and "non-movable" ions can be either a cation or anion. In a single-cation conductor, the "movable" ion is a cation and the "non-movable" ion is an anion in the main or side chains of the polymer. In a single-anion conductor, the "movable" and "non-movable" ions are reversed. See Figure 1 below which clearly shows the two types of ions and repeats general formulas (I) and (III) shown on page 4 of Applicant's specification.

Figure 1



single-cation conductor single-anion conductor

Besides the clear showing in the formulas, the specification includes support for the language of "at least one movable ion" in paragraph [0020]. Paragraph [0020] states, "the ether (polymer) chain dissociates counter ions from the ions attached to the main chain and allows the ions to *move* much more freely." However, in the interest of expediting prosecution the claims have been amended to substitute in the more commonly used terms of "associated" for "movable" and "attached" for non-movable.

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Discussion of Rejection Under 35 U.S.C. § 103(a)

Claims 1-4, 9-10, 12, 15, 17, and 18-21 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee et al, Applied Physics Letters, Volume 72, Number 19.

Independent Claims 1-2, and 5 recite an electroluminescent device that has as part of its features an electron-injecting layer and a separate hole-injecting layer. Independent Claims 17-18 recite an electroluminescent device that has as part of its features an electron-injecting layer Independent Claim 19 has as part of its features a hole-injecting layer. The electron- and hole-injecting layers are comprised of a polymeric compound that contains at least one block of $[O-(CH_2)_x]_y$ units, an associated ion, and an attached ion. Both x and y are integers equal to or greater than two. The associated and attached ions are counter ions. Claims 3-4, 9-10, and 12 depending from Claim 2 incorporate these limitations of Claim 2. Claims 20-21 depending from Claim 1 incorporate these limitations of Claim 1.

Lee et al, Applied Physics Letters, Volume 72, Number 19

Lee, et al., describes polymer light-emitting diodes that use an ionomer as an electron-injecting and hole-blocking material. The devices were constructed by layering the materials on top of each other. For one device, the layers are as follows: a semi-transparent layer coated on a glass substrate (ITO), emissive layer (MEH-PPV), electron-injecting layer (ionomer), and cathode. In the other device, the emissive and electron-injecting layers are switched.

An ionomer is a polymer having unique physical properties due to ionic interactions in discrete regions of the materials. http://scienceworld.wolfram.com/chemistry/ionomer.html. The ionomer utilized by Lee is sodium sulfonated polystyrene (SSPS). SSPS has a hydrocarbon backbone with anions attached to the phenyl side chains. Each of the anions is associated with a cation. In SSPS, the anions and cations are sulfide and sodium respectively. The chemical structure is shown below in Figure 2. Under an electric field, the cations become dissociated from the anions and migrate towards the adjacent cathode. This allows efficient electron injection to occur.

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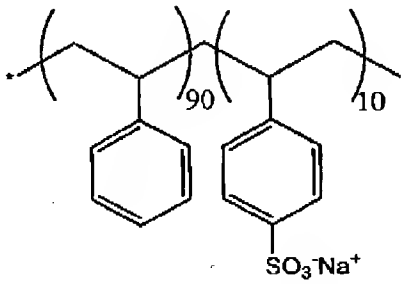
Figure 2



Applicant's invention is similar to the Lee reference in that both use a polymeric, electron-injection material with associated ions and incorporate the material as a separate layer in an electroluminescence device. However, unlike the polymeric material in Lee the claims recite polymeric materials that incorporate ether units, $[O\text{-}(CH_2)_x]_y$. There is no teaching or suggestion in the Lee reference to use polymeric materials that incorporate ether units. Further, the inventors compared the EL efficiency of the subject invention (i.e., EL device employing the ether chain) with that of EL device using SSPS (see: Example 1), which clearly reveals that embodiments of the claimed EL device show EL efficiency about 5 times greater than the conventional one (see: [0039] and FIG. 2 of the US Patent Appln. Pub. No. US2002/0037432 A1). In addition, Lee does not describe the use of a polymeric, hole-injecting material as a layer in a multilayer electroluminescent device. Consequently, Applicant respectfully submits that the prior art does not teach or suggest all of the claim limitations nor does it imply a reasonable likelihood of success to modify Lee.

Conclusion

If the Examiner has any questions that can be answered by a telephone call, she is respectfully invited to call the undersigned.

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Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 7/27/04

By: _____

John M. Carson
Registration No. 34,303
Attorney of Record
Customer No. 20,995
(619) 235-8550

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